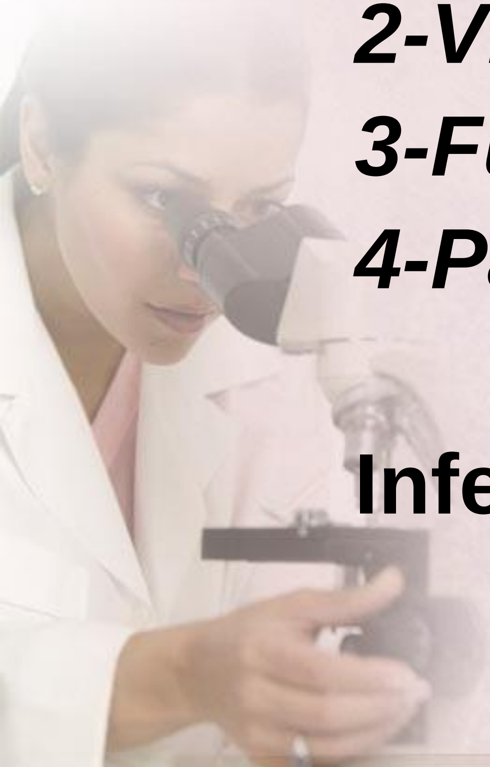
بسم الله الرحمن الرحيم

INFECTION

Outlines

- Definition
- Toxemia.
- Bacteremia.
- Septicemia.
- Pyemia.
- Bacteria: Tuberculosis, Syphilis,Leprosy.
- Fungi: Actinomycosis.
- Parasites: Bilharziasis.

It is invasion of tissues by living micro-organisms



Microorganisms include:

1-Bacteria (Most of them are Harmless and few are Pathogenic)

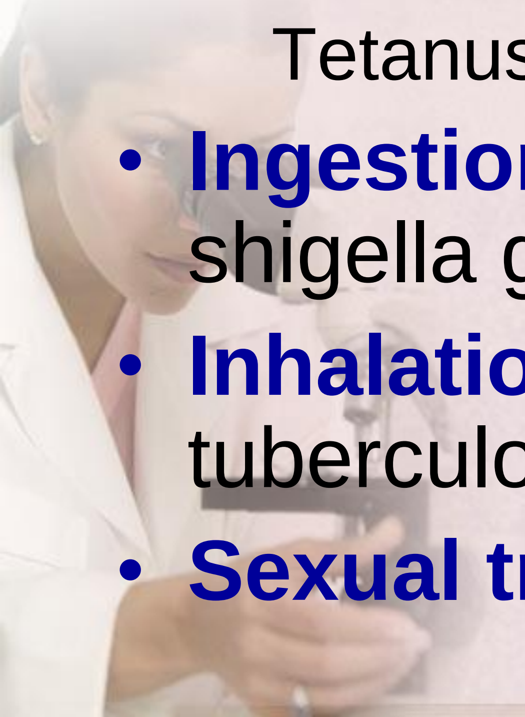
2-Viruses

3-Fungi

4-Parasites

Infestation = Parasitic invasion

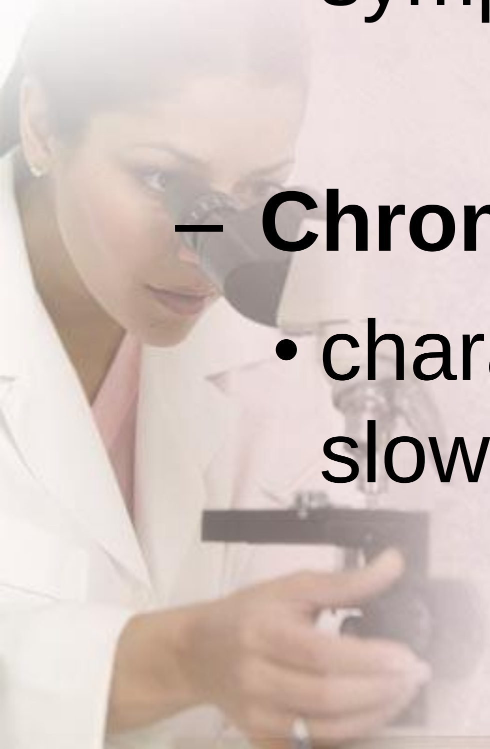
ROUTES OF ENTRY OF MICRO-ORGANISMS

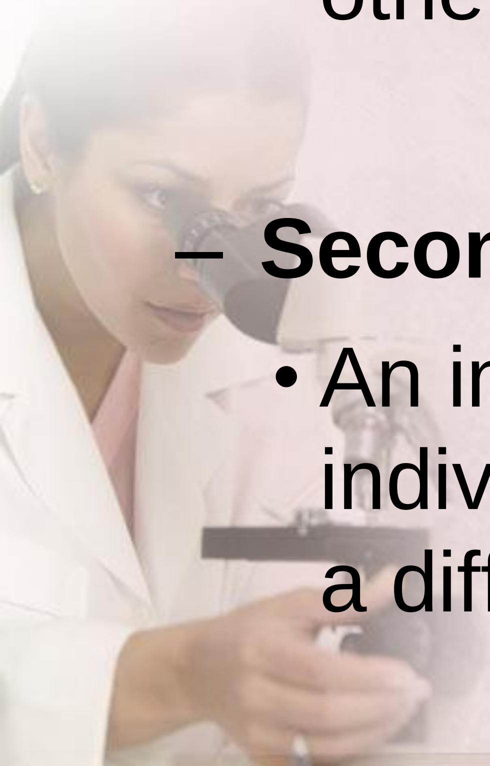


- **Skin or mucous membrane:**
  - **Close contact:** e.g. Venereal diseases as syphilis and gonorrhea
  - **Inoculation:** e.g. Hepatitis B &C, AIDS
  - **Wound and abrasions:** e.g. Skin infection, Tetanus and Rabies
- **Ingestion:** e.g. Hepatitis A, typhoid, shigella group
- **Inhalation:** e.g. Influenza, diphtheria and tuberculosis
- **Sexual transmission:** e.g Syphilis

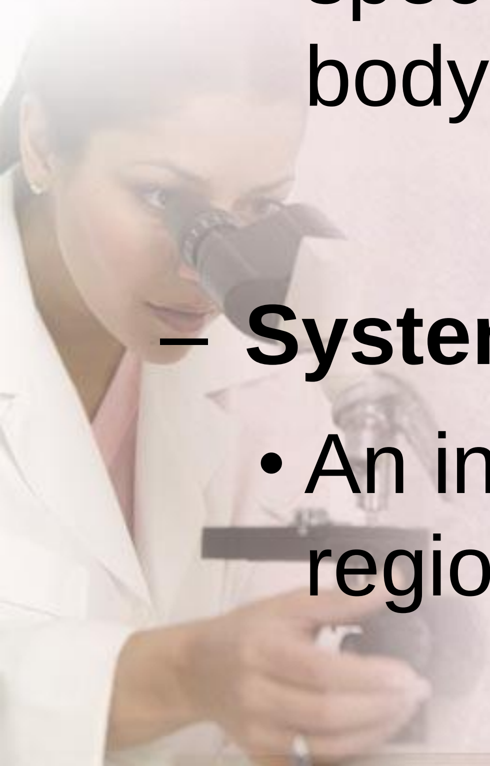
- **Acute infection vs. chronic infection**
  - **Acute Infection**
    - characterized by sudden onset, rapid progression and often with severe symptoms

  - **Chronic Infection**
    - characterized by delayed onset and slow progression

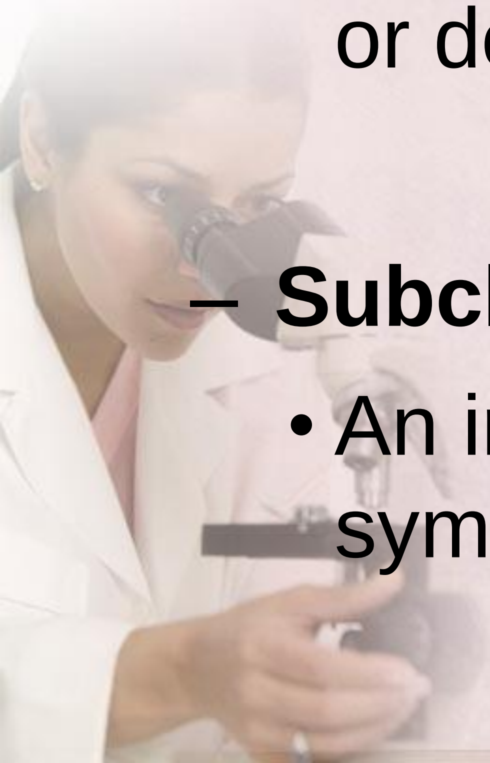




- **Primary infection vs. secondary infection**
  - **Primary Infection**
    - An infection that develops in an otherwise healthy individual
  - **Secondary Infection**
    - An infection that develops in an individual who is already infected with a different pathogen



- **Localized infection vs. systemic infection**
  - **Localized Infection**
    - An infection that is restricted to a specific location or region within the body of the host
  - **Systemic Infection**
    - An infection that has spread to several regions or areas in the body of the host



- **Clinical infection vs. subclinical infection**
  - **Clinical Infection**
    - An infection with obvious observable or detectable symptoms
  - **Subclinical Infection**
    - An infection with few or no obvious symptoms

Body resistance is lowered by

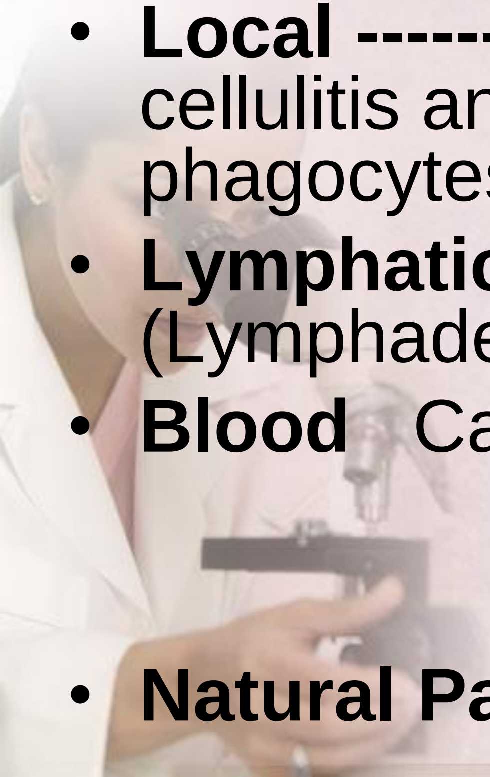
1-Severe fatigue

2-Exposure to cold

3-Chronic debilitating disease .eg: diabetes mellitus

4-Patients receiving immunosuppresive drugs

EFFECTS OF INFECTION



1- Inflammation:

- **Acute:** e.g. Diphtheria
- **Chronic:** e.g. T.B.

2-Production of toxins: **causing toxemia**

3- Spread of infection

- **Local -----------**To surrounding tissues leading to cellulitis and abscess (bacteria move or inside phagocytes)
- **Lymphatic ----------** To lymph nodes (Lymphadenitis)
- **Blood** Causing: 1- Bacteremia
  2- Septicemia
  3- Pyemia
- **Natural Passages** As ureter

Toxemia

Toxemia

- Circulation of bacterial toxins in the blood with production of clinical and pathological manifestations.
- Types:

- Acute toxemia: Large doses of toxins reach blood within short time e.g. diphtheria, cholera.
- Chronic toxemia: small doses of toxins reach blood along prolonged periods e.g. T.B., syphilis.

Toxemia

- Effects:
- Clinical: fever, headache, rigor, loss of appetite, loss of weight, tachycardia.
- Pathological:
- Inflammation.
- Degeneration :
- Acute toxemia: cloudy swelling, fatty change in liver , heart, kidney.
- Chronic toxemia: amyloidosis.
- Necrosis.

Bacteremia

Bacteremia

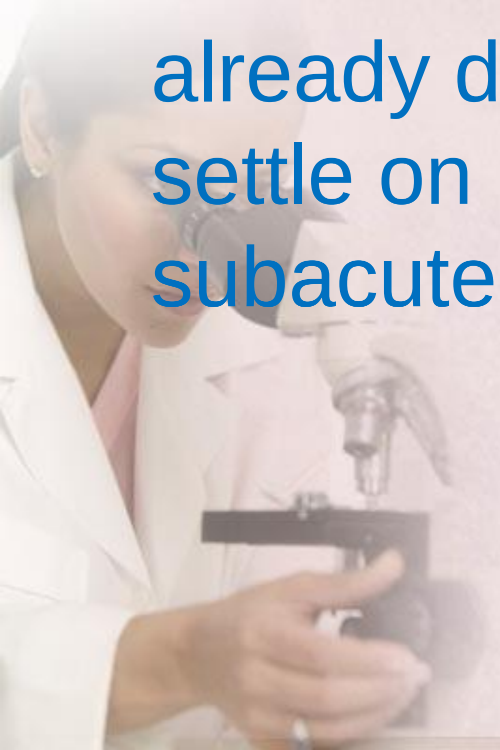
- Circulation of relatively small number of bacteria that do not multiply in blood.
- Source of bacteria:
- Endogenous: strept. viridans by tooth extract.
- Exogenous: early stages of certain diseases e.g. typhoid fever, syphilis..

Bacteremia

- **Effects of bacteremia:**

- Small dose with high resistance: No effect.

- Low resistance: the bacteria may be lodged in already diseased tissue e.g. strept. Viridians settle on previously diseased valve causing subacute bacterial endocarditis (SBE).



Septicemia

Septicemia

- Circulation and multiplication of large amount of virulent **microorganisms** with their **toxins** in the blood without localization.
- Examples:
  - Strept Hemolyticus: in puerperal sepsis.
  - Staph aureus: in acute osteomyelitis.
  - Meningococci: in septic meningitis.

Pyemia

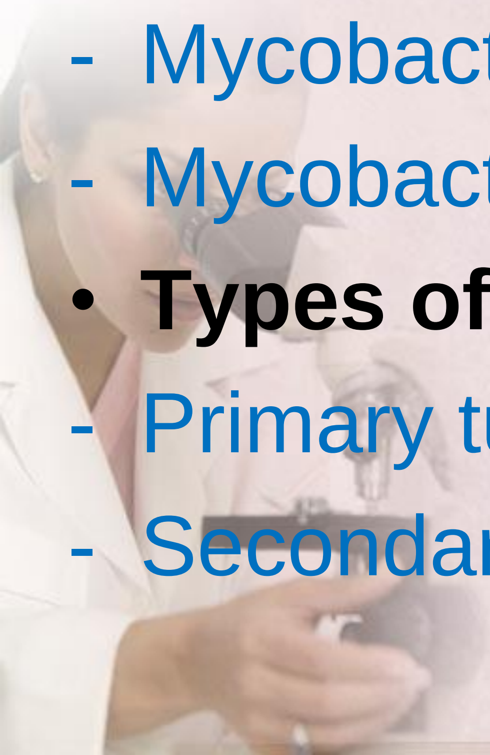
Pyemia

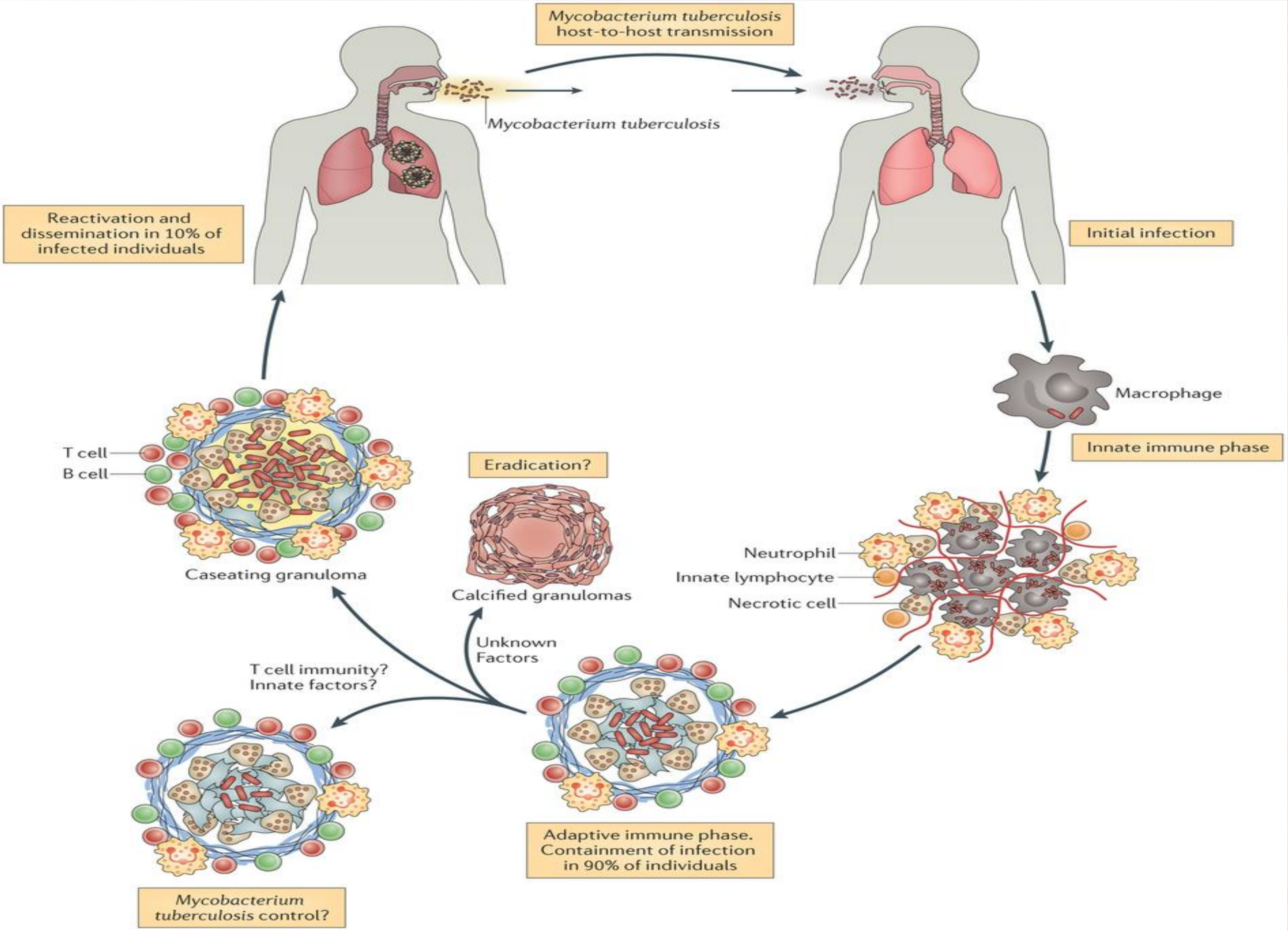
- Circulation of septic emboli with their localization in the organs.
- Causative organism: usually staph aureus

Tuberculosis

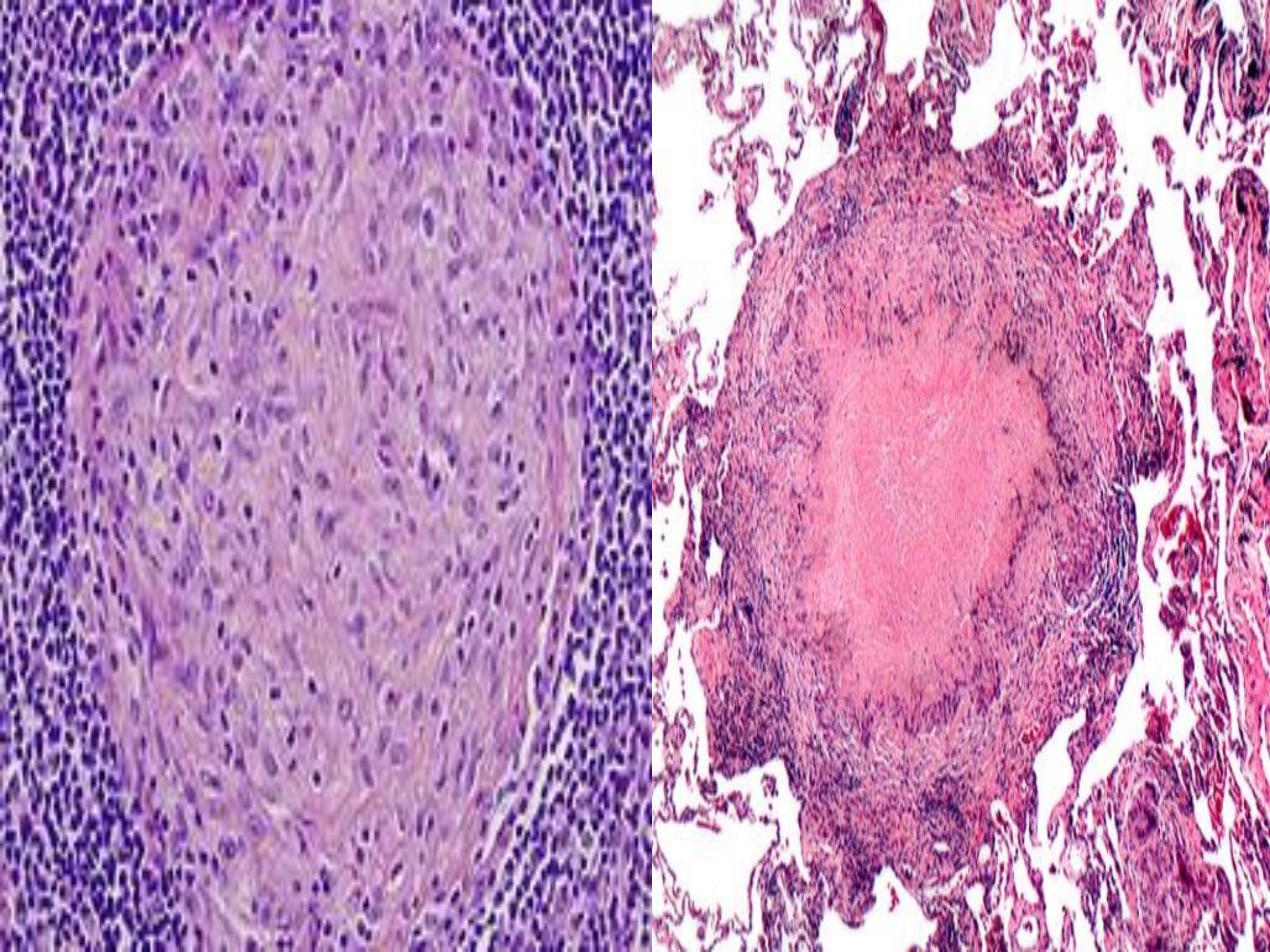
Tuberculosis

- Mycobacterium bacilli (aerobic, acid fast, non-motile, not produce exotoxins.
- **Types of bacteria:**
  - Mycobacterium tuberculosis (inhalation).
  - Mycobacterium Bovis (Ingestion).
- **Types of tuberculosis:**
  - Primary tuberculosis.
  - Secondary tuberculosis.




Mycobacterium tuberculosis host-to-host transmission
Mycobacterium tuberculosis
Initial infection
Macrophage
Innate immune phase
Neutrophil
Innate lymphocyte
Necrotic cell
Adaptive immune phase. Containment of infection in 90% of individuals
Unknown Factors
Eradication?
Calcified granulomas
T cell immunity? Innate factors?
Mycobacterium tuberculosis control?
T cell
B cell
Caseating granuloma
Reactivation and dissemination in 10% of infected individuals

Nature Reviews | Microbiology



(PRIMARY TB)

Def

-1st infection.

-Non immunized persons-Young ages (< 3 years).

Methods of Infection: **(exogenous)**

1)Inhalation 2) Ingestion 3) Direct contact.

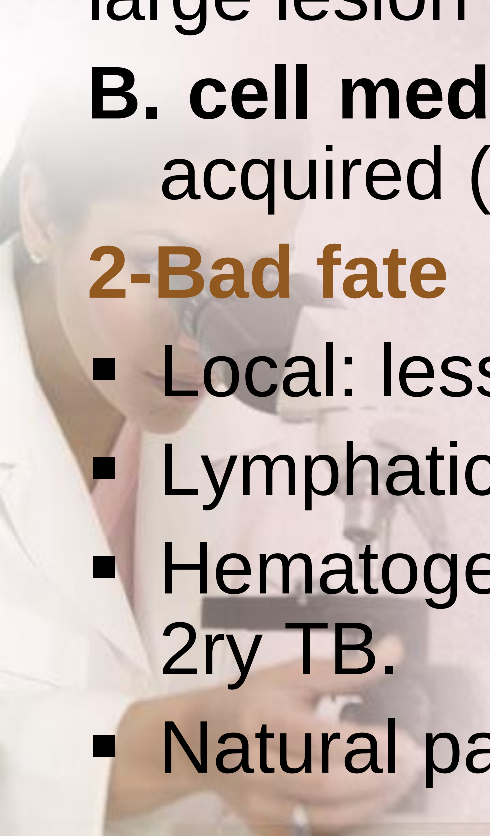
Site of 1ry complex:

1-Lung
2. Intestine
3. Tonsils
4. Skin.
5. Nose

Reaction of the body against bacilli in 1ry infection.

Proliferative reaction → tubercles.

FATE OF PRIMARY TB



I- Good fate (98%)

A. Healing

Small lesion ➔ small fibrous scar

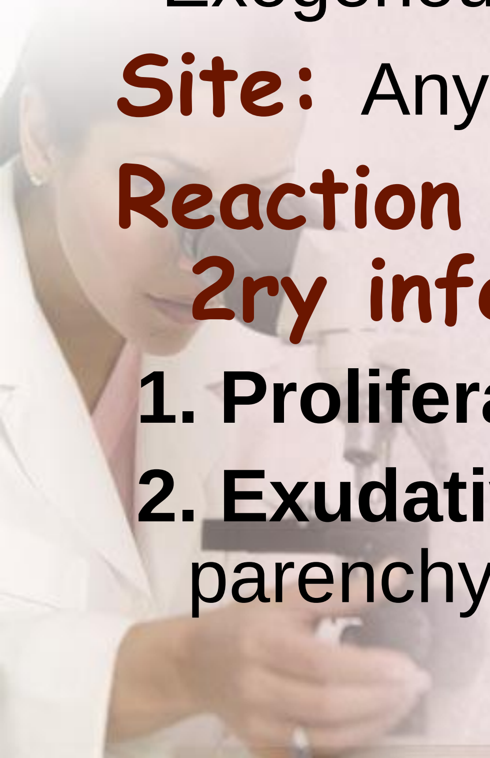
large lesion ➔ calcification & encapsulation.

B. cell mediated immunity & hypersensitivity is acquired (dormant bacilli).

2-Bad fate (2%) ⟶ Spread:

- Local: less than 2ry TB.
- Lymphatic: more than 2ry TB.
- Hematogenous **(miliary)** spread is more than in 2ry TB.
- Natural passages spread: less than in 2ry TB.

SECONDARY TB



occurs in patient who encountered either previous 1ry infection or. B.C.G. vaccine

METHODS OF INFECTION

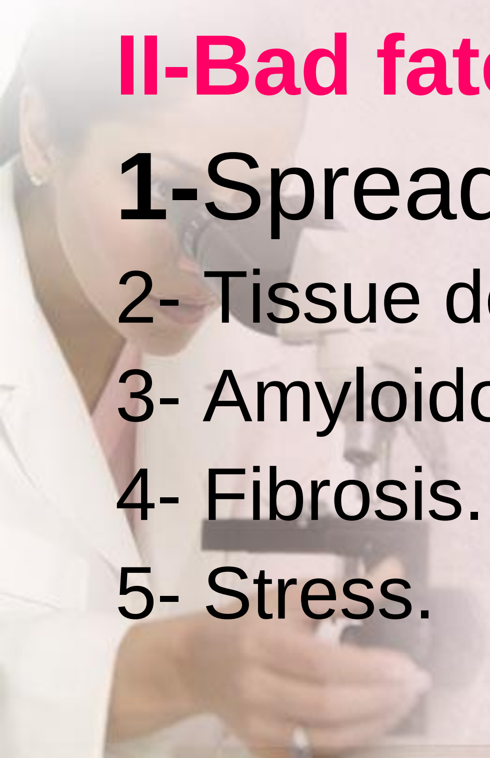
- Endogenous by reactivation of dormant focus.
- Exogenous by inhalation or ingestion.

Site: Any site

Reaction of the body against bacilli in 2ry infection:

1. **Proliferative** reaction in solid organs.
2. **Exudative** reaction in serous sacs & in soft parenchymatous organs.

FATE OF 2RY TB



I- Good fate;

Healing: fibrosis, calcification, encapsulation & cavity formation with epithelialization.

II-Bad fate :

1-Spread: local- Blood- lymphatic natural passages.

2- Tissue destruction.

3- Amyloidosis.

4- Fibrosis.

5- Stress.

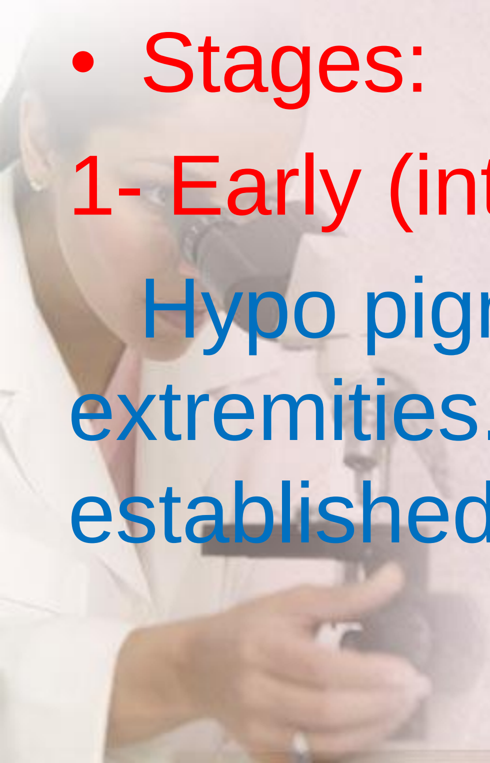
Leprosy

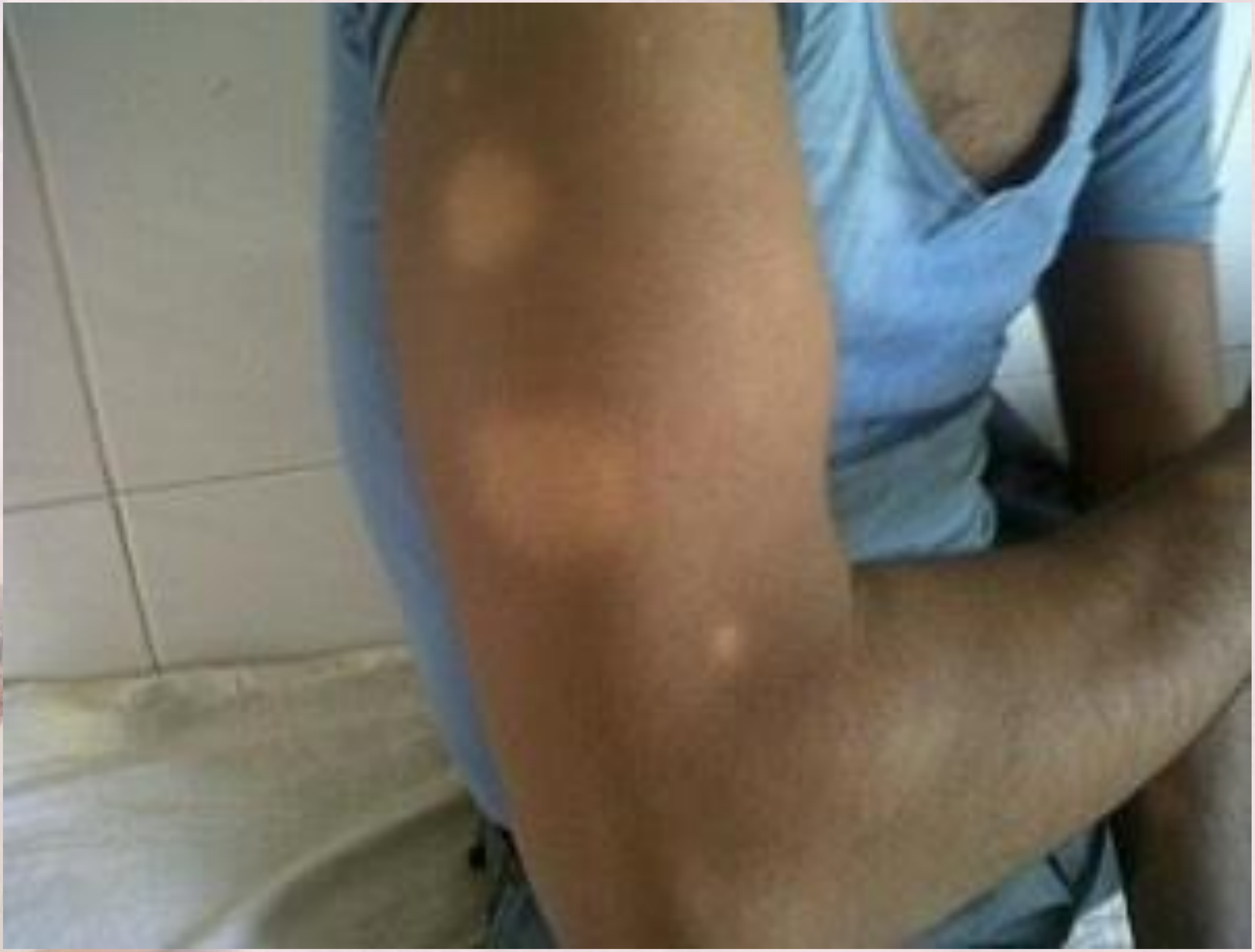
Leprosy

- Mycobacterium Leprae.
- Prolonged contact (5-10 years) with a patient through respiratory mucosa or skin abrasion.
- Stages:

1- Early (intermediate) leprosy:

Hypo pigmented anesthetic macules on face & extremities. 75% heal, 25% progress to established leprosy.





Leprosy

- Stages:

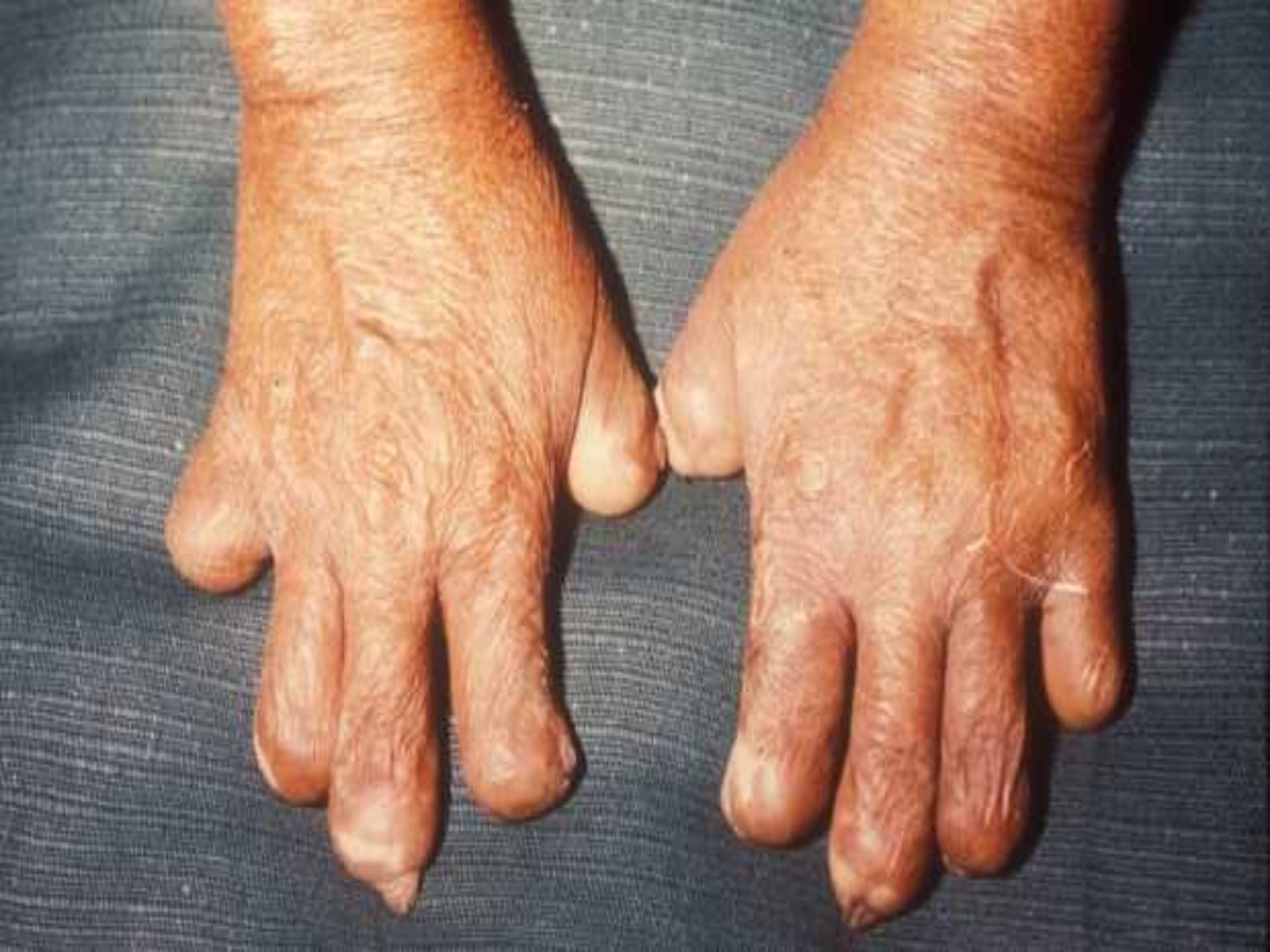
2- Established leprosy:

Two forms:

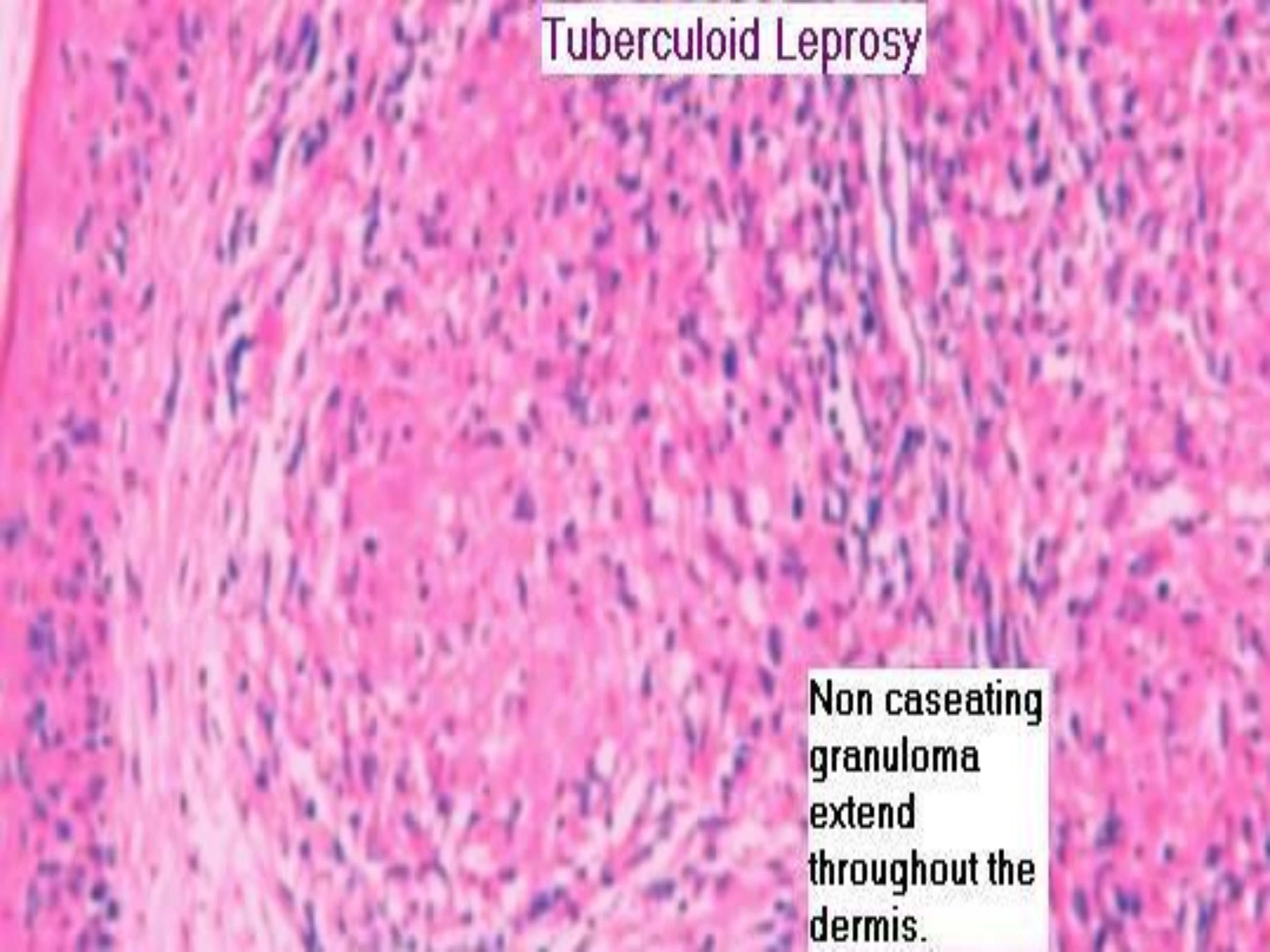
A- Lepromatous (nodular) leprosy: Multiple nodules on the face (leonine facies), mucous membranes (nose), peripheral nerves.

B- Tuberculoid (neural) leprosy:

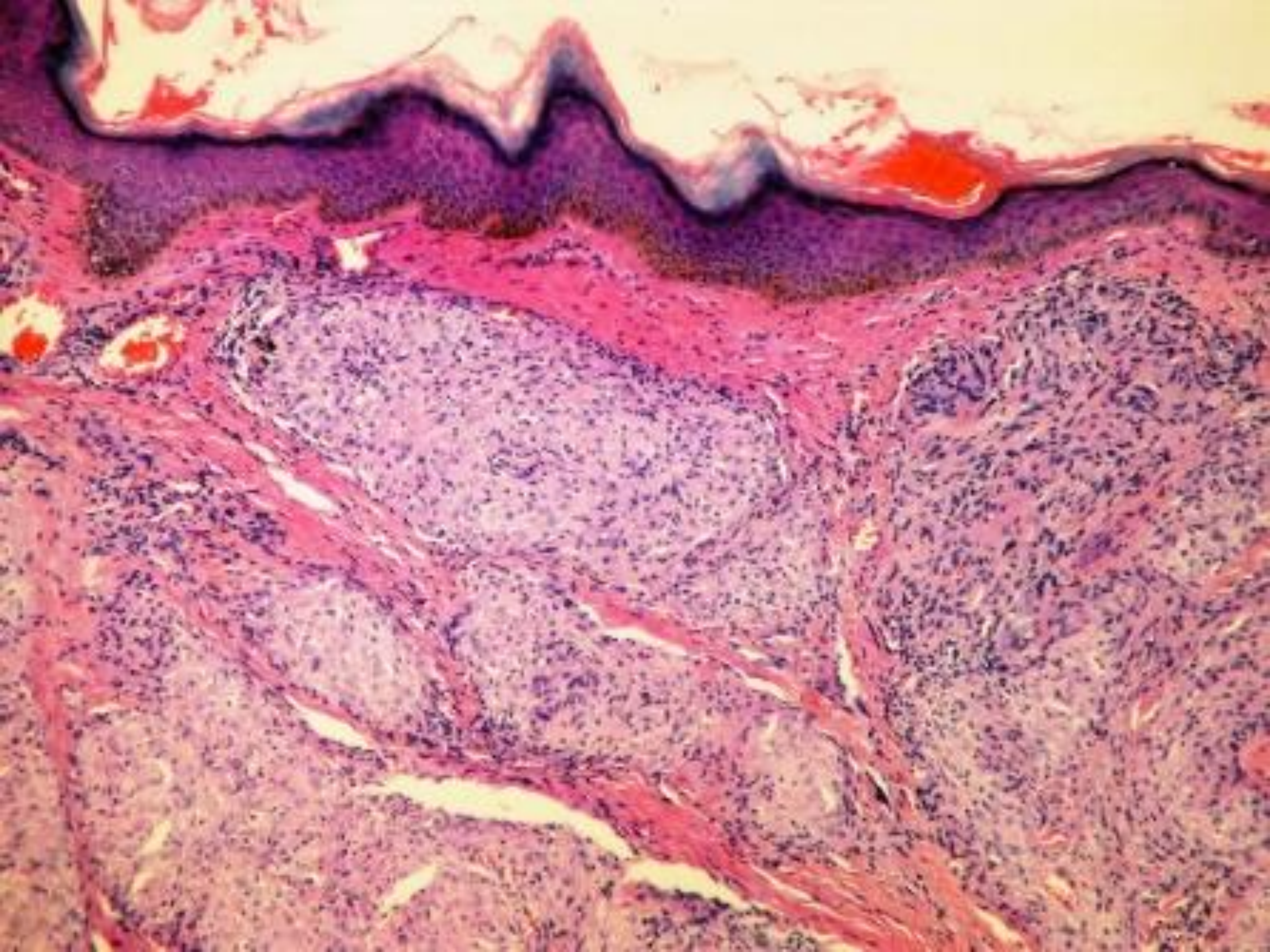
- Few hypopigmented macules with anesthetic centers.
- Diffuse thickening of nerves , destruction, muscle atrophy, paralysis, claw hands.



Tuberculoid Leprosy



Non caseating granuloma extend throughout the dermis.



Bilharziasis

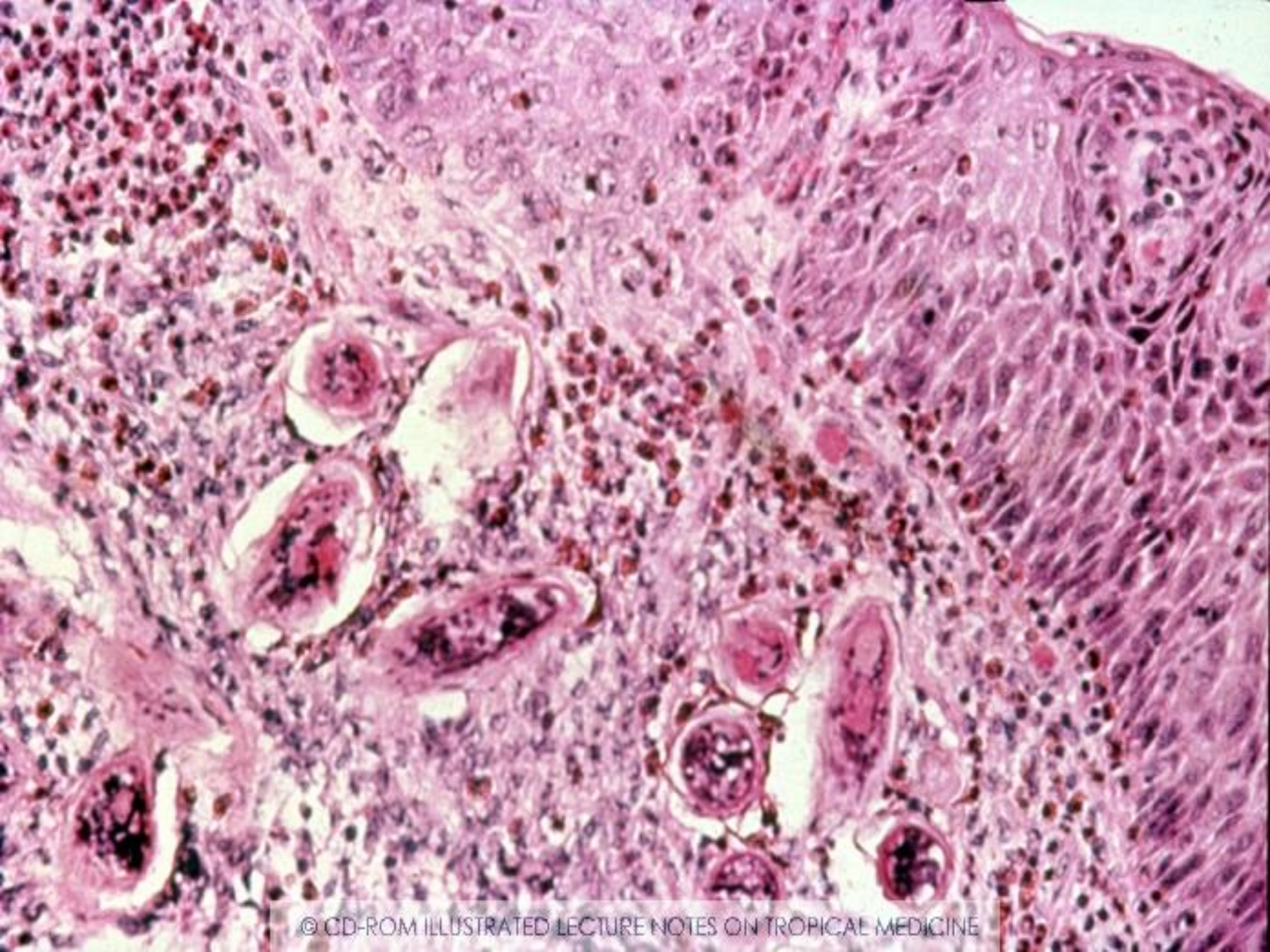
Bilharziasis

- Parasitic granuloma.
- Schistosoma haematobium: affect urinary tract
- Schistosoma mansoni affect gastrointestinal tract.
- Schistosoma Japonicum.

Bilharziasis

* Complications:

- Schistosoma haematobium: Cancer urinary bladder (squamous cell carcinoma).
- Schistosoma mansoni : Liver fibrosis, portal hypertension, hematemesis.



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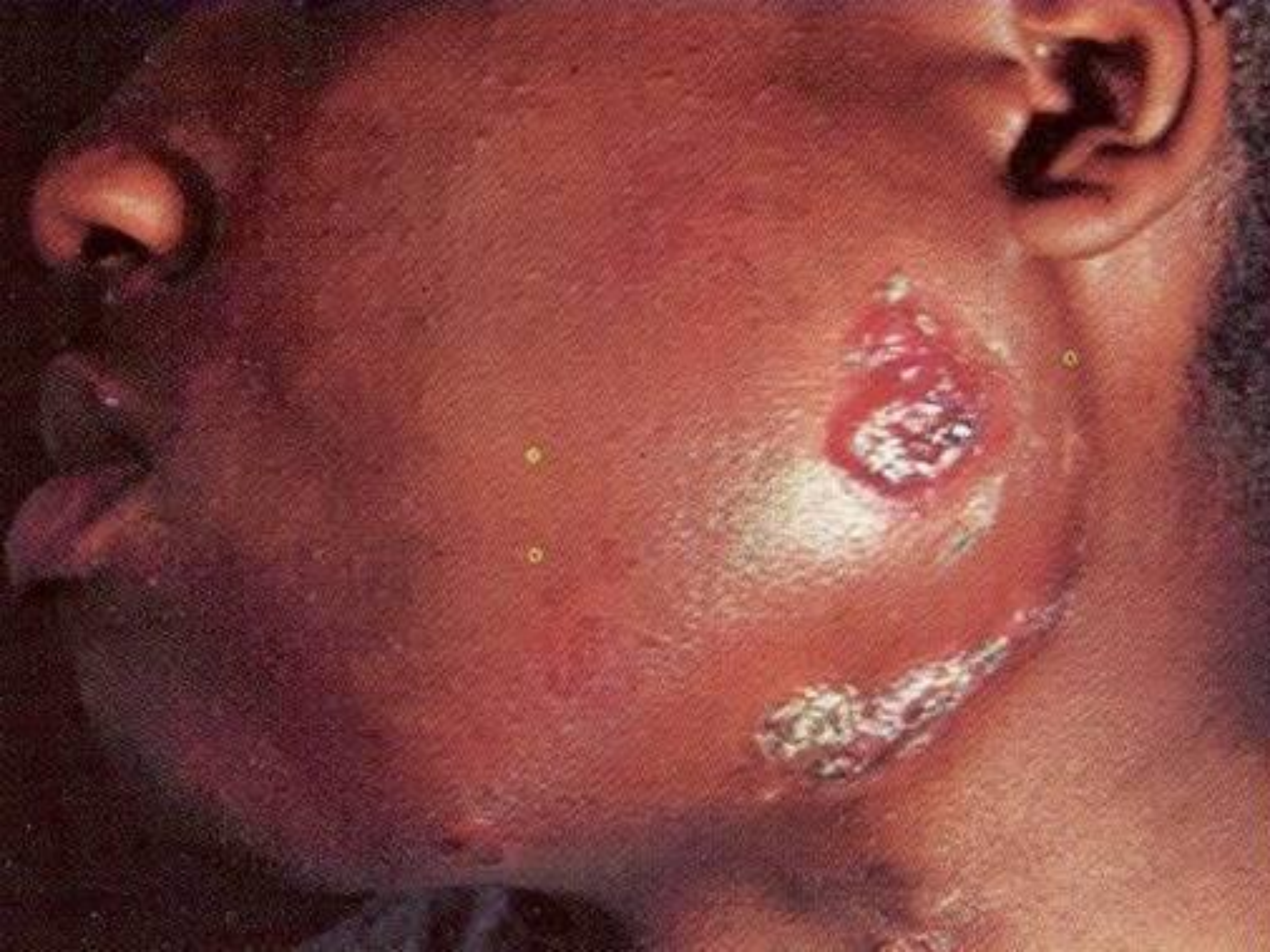
Actinomycosis

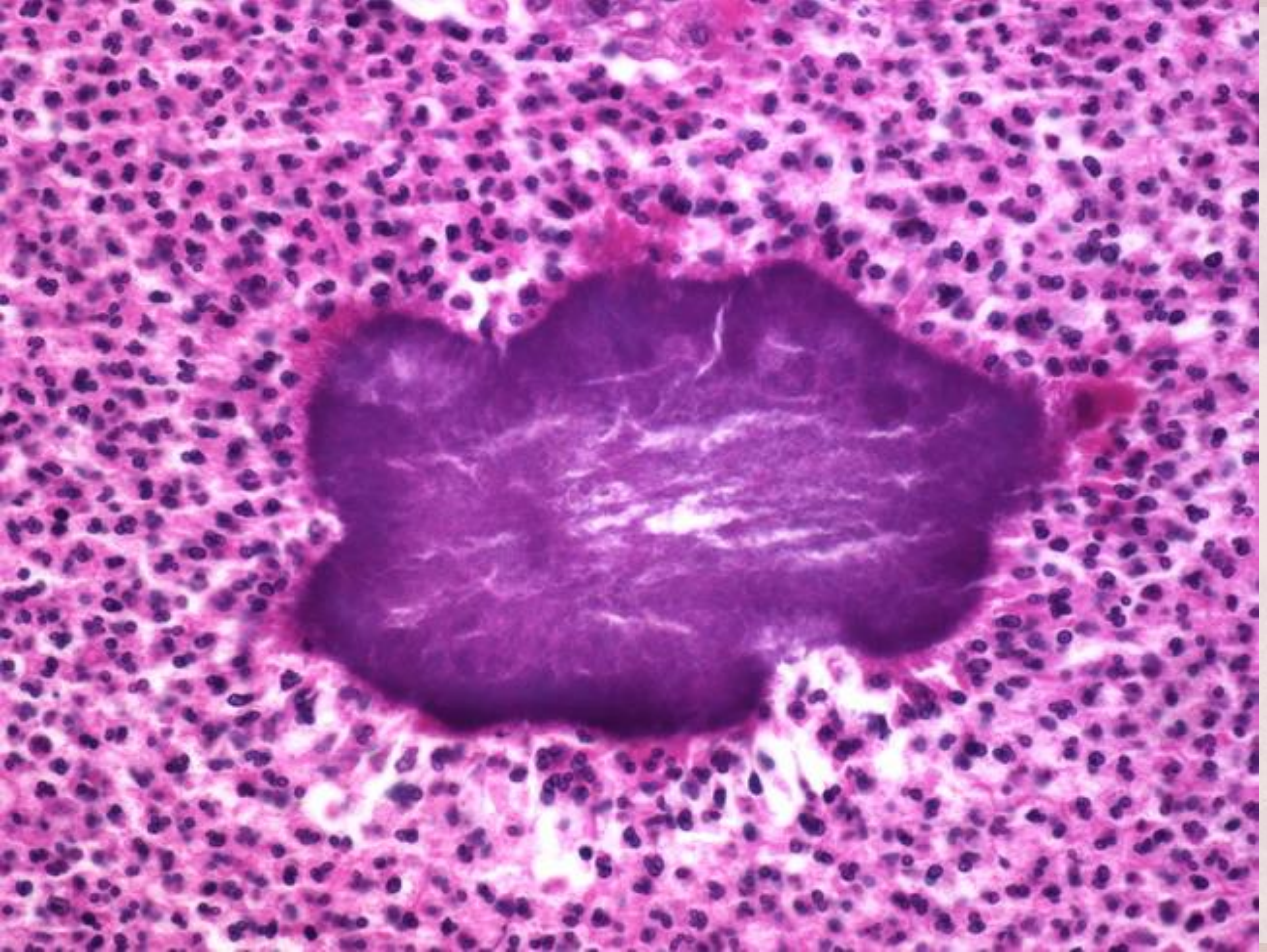
Actinomycosis

- Suppurative granuloma.
- Multilocular abcess.
- Caused by pseudo fungus (actinomyces Israeli).
- Found normally in mouth, intestinal mucosa
- Abrasions of mucosa e.g tooth extraction: invasion to deep tissues.

Actinomycosis

- Sites:
- Cervicofacial.
- Abdominal.
- Lung.
- Skin.





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